APPENDIX B

Frequency of Maintenance Tests

NETA recognizes that the ideal maintenance program is reliability-based, unique to each plant and to each piece of equipment. In the absence of this information and in response to requests for a maintenance timetable, NETA's Standards Review Council presents the following time-based maintenance schedule and matrix.

One should contact a NETA Accredited Company for a reliability-based evaluation.

The following matrix is to be used in conjunction with NETA's Frequency of Maintenance Tests table. Application of the matrix is recognized as a guide only.

Specific condition, criticality, and reliability must be determined to correctly apply the matrix. Application of the matrix, along with the culmination of historical testing data and trending, should provide a quality electrical preventive maintenance program.

MAINTENANCE FREQUENCY MATRIX				
	EQUIPMENT CONDITION			
		POOR	AVERAGE	GOOD
INT ITY IENT	LOW	1.0	2.0	2.5
EQUIPME) RELIABILI REQUIREM	MEDIUM	0.50	1.0	1.5
	HIGH	0.25	0.50	0.75

APPENDIX B (cont.) Inspections and Tests (Frequency in Months) Multiplier for Inspections and Tests (Multiply Value by Matrix)

Section	Description	17: a a.l	Visual &	Visual & Mechanical	
7.1	Description Switchgear & Switchboard Assemblies	Visual 12	Mechanical 12	& Electrical	
7.1	Transformers 12 12 24				
7.2.1.1	Small Dry-Type Transformers	2	12	36	
7.2.1.1	Large Dry-Type Transformers	1	12	24	
7.2.2	Liquid-Filled Transformers	1	12	24	
	Sampling	_	_	12	
7.3	Cables	+	•		
7.3.2	Low-Voltage Cables	2	12	36	
7.3.3	Medium- and High-Voltage Cables	2	12	36	
7.4	Metal-Enclosed Busways	2	12	24	
	Infrared Only	_	_	12	
7.5	Switches				
7.5.1.1	Low-Voltage Air Switches	2	12	36	
7.5.1.2	Medium-Voltage Metal-Enclosed Switches	_	12	24	
7.5.1.3	Medium- and High-Voltage Open Switches	1	12	24	
7.5.2	Medium-Voltage Oil Switches	1	12	24	
7.5.3	Medium-Voltage Vacuum Switches	1	12	24	
7.5.4	Medium-Voltage SF ₆ Switches	1	12	24	
7.5.5	Cutouts	12	24	24	
7.6	Circuit Breakers				
7.6.1.1	Low-Voltage Insulated-Case/Molded-Case CB	1	12	36	
7.6.1.2	Low-Voltage Power CB	1	12	36	
7.6.1.3	Medium-Voltage Air CB	1	12	36	
7.6.2	Medium-Voltage Oil CB	1	12	36	
	Sampling	_	_	12	
7.6.2	High-Voltage Oil CB	1	12	12	
	Sampling	_	_	12	
7.6.3	Medium-Voltage Vacuum CB	1	12	24	
7.6.4	Extra-High-Voltage SF ₆	1	12	12	
7.7	Circuit Switchers	1	12	12	
7.8	Network Protectors	12	12	24	

APPENDIX B (cont.)

Inspections and Tests
(Frequency in Months)
Multiplier for Inspections and Tests
(Multiply Value by Matrix)

7.9. Protective Relays 7.9.1 Electrical/Mechanical and Solid State 7.9.2 Microprocessor-Based 1 1 12 12 7.10 Instrument Transformers 1 1 12 12 36 7.11 Metering Devices 1 12 12 12 36 7.12 Regulating Apparatus 7.12.1.1 Step-Voltage Regulators 7.12.1.1 Step-Voltage Regulators 1 1 12 24 7.12.2 Induction Regulators 1 1 12 24 7.12.2 Current Regulators 1 1 12 24 7.12.3 Load-Tap-changers 1 1 12 24 7.12.4 Sample Liquid 7.12.5 Sample Liquid 7.13 Grounding Systems 7.14 Ground-Fault Protection Systems 7.15 Rotating Machinery 7.15.1 AC Motors 7.15.3 DC Motors 7.15.3 DC Generators 7.15.4 AC Generators 7.16.1 Low-Voltage Motor Starters 7.16.1.1 Low-Voltage Motor Starters 7.18 Direct-Current Systems 7.18 Datteries 7.18 Batteries 7.18 Batteries 7.18 Batteries 7.19.1 Low-Voltage Devices 7.19.2 Medium-Voltage Devices 7.19.2 Medium-In High-Voltage Devices 7.19.1 Low-Voltage Devices 7.10 Low-Voltage Devices 7.10 Low-Voltage Devices 7.10 Low-Voltage Devices 7.11 Low-Voltage Devices 7.12 Low-Voltage Devices 7.1	Section	Description	Visual	Visual & Mechanical	Visual & Mechanical & Electrical	
7.9.2 Microprocessor-Based 1 12 12 12 13 10 11 12 12 12 36 11 12 12 36 11 12 12 36 11 12 12 36 12 12 36 12 12 36 12 12 36 12 12 36 12 12 36 12 12 36 12 12 36 12 12 36 12 12 12 12 12 12 12 1	7.9		<u> </u>		<u> </u>	
Texas	7.9.1	Electrical/Mechanical and Solid State	1	12	12	
7.11 Metering Devices 12 12 36 7.12 Regulating Apparatus 7.12.1.1 Step-Voltage Regulators 1 12 24 Sample Liquid - - 12 7.12.1.2 Induction Regulators 1 12 24 7.12.2. Current Regulators 1 12 24 7.12.3 Load-Tap-changers 1 12 24 Sample Liquid - - 12 7.13 Grounding Systems 2 12 24 7.14 Ground-Fault Protection Systems 2 12 12 7.15 Rotating Machinery - - - 12 7.15.1 AC Motors 1 12 24 7.15.1 AC Generators 1 12 24 7.15.1 AC Generators 1 12 24 7.15.3 DC Generators 1 12 24 7.16.1 Motor Control - - 1 12 24 7.16.1 Low-Voltage Motor Starters 2 12 24 7.16.1.1 Low-Voltage Motor Control Centers 2 12 24 7.16.2.2	7.9.2	Microprocessor-Based	1	12	12	
7.12 Regulating Apparatus	7.10	Instrument Transformers	12	12	36	
7.12.1.1 Step-Voltage Regulators 1 12 24 Sample Liquid - - 12 12 24 7.12.1.2 Induction Regulators 1 12 24	7.11	Metering Devices	12	12	36	
Sample Liquid	7.12	Regulating Apparatus				
7.12.1.2 Induction Regulators 12 12 24 7.12.2 Current Regulators 1 12 24 7.12.3 Load-Tap-changers 1 12 24 Sample Liquid - - 12 24 7.13 Grounding Systems 2 12 24 24 7.14 Ground-Fault Protection Systems 2 12 12 24 7.15 Rotating Machinery - - 12 24 7.15.1 AC Motors 1 12 24 7.15.1 AC Motors 1 12 24 7.15.3 DC Motors 1 12 24 7.15.3 DC Generators 1 12 24 7.15.3 DC Generators 1 12 24 7.16.1 Motor Control - - 12 24 7.16.1 Low-Voltage Motor Starters 2 12 24 7.16.1.1 Low-Voltage Motor Control Centers 2 12 24 7.16.2.2 Medium-Voltage Mot	7.12.1.1	Step-Voltage Regulators	1	12	24	
7.12.2 Current Regulators 1 12 24 7.12.3 Load-Tap-changers 1 12 24 Sample Liquid — — — 12 7.13 Grounding Systems 2 12 24 7.14 Ground-Fault Protection Systems 2 12 12 7.15 Rotating Machinery — — — 12 7.15.1 AC Motors 1 12 24 7.15.3 DC Motors 1 12 24 7.15.1 AC Generators 1 12 24 7.16.1 AC Generators 1 12 24 7.16.1 Motor Control — — — 2 12 24 7.16.1 Low-Voltage Motor Starters 2 12 24		Sample Liquid	_	_	12	
7.12.3 Load-Tap-changers 1 12 24 Sample Liquid - - 12 12 7.13 Grounding Systems 2 12 12 24 7.14 Ground-Fault Protection Systems 2 12 12 12 7.15 Rotating Machinery - - - 12 12 12 7.15.1 AC Motors 1 1 12 24 12 24 12 24 15.3 DC Motors 1 12 24 24 12 24 <	7.12.1.2	Induction Regulators	12	12	24	
Sample Liquid - - 12 7.13 Grounding Systems 2 12 24 7.14 Ground-Fault Protection Systems 2 12 12 7.15 Rotating Machinery - - - 24 7.15.1 AC Motors 1 12 24 7.15.3 DC Motors 1 12 24 7.15.1 AC Generators 1 12 24 7.15.3 DC Generators 1 12 24 7.16.1 AC Generators 1 12 24 7.16 Motor Control - - 2 12 24 7.16 Motor Control - - 2 12 24 7.16.1.1 Low-Voltage Motor Starters 2 12 24 7.16.1.2 Medium-Voltage Motor Control Centers 2 12 24 7.16.2.1 Low-Voltage Motor Control Centers 2 12 24 7.18 Direct-Current Systems 1 12 2 7.18.1 Batteries<	7.12.2		1			
7.13 Grounding Systems 2 12 24 7.14 Ground-Fault Protection Systems 2 12 12 7.15 Rotating Machinery	7.12.3	Load-Tap-changers	1	12	24	
7.14 Ground-Fault Protection Systems 2 12 12 7.15 Rotating Machinery 2 1 12 24 7.15.1 AC Motors 1 12 24 7.15.3 DC Motors 1 12 24 7.15.1 AC Generators 1 12 24 7.15.3 DC Generators 1 12 24 7.16 Motor Control 3 12 24 7.16 Motor Control 2 12 24 7.16.1.1 Low-Voltage Motor Starters 2 12 24 7.16.1.2 Medium-Voltage Motor Control Centers 2 12 24 7.16.2.1 Low-Voltage Motor Control Centers 2 12 24 7.16.2.2 Medium-Voltage Motor Control Centers 2 12 24 7.18 Direct-Current Systems 1 12 24 7.18.1 Batteries 1 12 12 7.18.2 Battery Chargers 1 12 12 7.18.3 Rectifiers 1 <td></td> <td>Sample Liquid</td> <td>_</td> <td>_</td> <td>12</td>		Sample Liquid	_	_	12	
7.15 Rotating Machinery 24 7.15.1 AC Motors 1 12 24 7.15.3 DC Motors 1 12 24 7.15.1 AC Generators 1 12 24 7.15.3 DC Generators 1 12 24 7.16 Motor Control <	7.13	Grounding Systems	2	12	24	
7.15.1 AC Motors 1 12 24 7.15.3 DC Motors 1 12 24 7.15.1 AC Generators 1 12 24 7.15.3 DC Generators 1 12 24 7.16 Motor Control Motor Control 7.16.1.1 Low-Voltage Motor Starters 2 12 24 7.16.1.2 Medium-Voltage Motor Control Centers 2 12 24 7.16.2.1 Low-Voltage Motor Control Centers 2 12 24 7.16.2.2 Medium-Voltage Motor Control Centers 2 12 24 7.16.1.2 Adjustable Speed Drive Systems 1 12 24 7.18 Direct-Current Systems 1 12 24 7.18.1 Batteries 1 12 12 12 7.18.2 Battery Chargers 1 12 24 7.19.1 Low-Voltage Devices 2 12 24	7.14	Ground-Fault Protection Systems	2	12	12	
7.15.3 DC Motors 1 12 24 7.15.1 AC Generators 1 12 24 7.15.3 DC Generators 1 12 24 7.16 Motor Control Motor Control 7.16.1.1 Low-Voltage Motor Starters 2 12 24 7.16.1.2 Medium-Voltage Motor Control Centers 2 12 24 7.16.2.1 Low-Voltage Motor Control Centers 2 12 24 7.16.2.2 Medium-Voltage Motor Control Centers 2 12 24 7.17 Adjustable Speed Drive Systems 1 12 24 7.18 Direct-Current Systems 1 12 12 7.18.1 Batteries 1 12 12 7.18.2 Battery Chargers 1 12 12 7.18.3 Rectifiers 1 12 24 7.19 Surge Arresters 7.19.1 Low-Voltage Devices 2 12 24	7.15	Rotating Machinery				
7.15.1 AC Generators 1 12 24 7.15.3 DC Generators 1 12 24 7.16 Motor Control Motor Starters 2 12 24 7.16.1.1 Low-Voltage Motor Starters 2 12 24 7.16.1.2 Medium-Voltage Motor Control Centers 2 12 24 7.16.2.1 Low-Voltage Motor Control Centers 2 12 24 7.16.2.2 Medium-Voltage Motor Control Centers 2 12 24 7.17 Adjustable Speed Drive Systems 1 12 24 7.18 Direct-Current Systems 1 12 12 7.18.1 Batteries 1 12 12 7.18.2 Battery Chargers 1 12 12 7.18.3 Rectifiers 1 12 24 7.19 Surge Arresters 7.19.1 Low-Voltage Devices 2 12 24	7.15.1	AC Motors	1	12	24	
7.15.3 DC Generators 1 12 24 7.16 Motor Control Motor Starters 7.16.1.1 Low-Voltage Motor Starters 2 12 24 7.16.1.2 Medium-Voltage Motor Control Centers 2 12 24 7.16.2.1 Low-Voltage Motor Control Centers 2 12 24 7.16.2.2 Medium-Voltage Motor Control Centers 2 12 24 7.17 Adjustable Speed Drive Systems 1 12 24 7.18 Direct-Current Systems 1 12 12 12 7.18.1 Batteries 1 12 12 12 7.18.2 Battery Chargers 1 12 12 12 7.18.3 Rectifiers 1 12 12 24 7.19 Surge Arresters 7.19.1 Low-Voltage Devices 2 12 12 24			1	12	24	
7.16 Motor Control 7.16.1.1 Low-Voltage Motor Starters 2 12 24 7.16.1.2 Medium-Voltage Motor Starters 2 12 24 7.16.2.1 Low-Voltage Motor Control Centers 2 12 24 7.16.2.2 Medium-Voltage Motor Control Centers 2 12 24 7.17 Adjustable Speed Drive Systems 1 12 24 7.18 Direct-Current Systems 7.18.1 Batteries 1 12 12 7.18.2 Battery Chargers 1 12 12 7.18.3 Rectifiers 1 12 24 7.19 Surge Arresters 7.19.1 Low-Voltage Devices 2 12 24	7.15.1	AC Generators	1		24	
7.16.1.1 Low-Voltage Motor Starters 2 12 24 7.16.1.2 Medium-Voltage Motor Starters 2 12 24 7.16.2.1 Low-Voltage Motor Control Centers 2 12 24 7.16.2.2 Medium-Voltage Motor Control Centers 2 12 24 7.17 Adjustable Speed Drive Systems 1 12 24 7.18 Direct-Current Systems 1 12 12 7.18.1 Batteries 1 12 12 7.18.2 Battery Chargers 1 12 12 7.18.3 Rectifiers 1 12 24 7.19 Surge Arresters 2 12 24	7.15.3	DC Generators	1	12	24	
7.16.1.2 Medium-Voltage Motor Starters 2 12 24 7.16.2.1 Low-Voltage Motor Control Centers 2 12 24 7.16.2.2 Medium-Voltage Motor Control Centers 2 12 24 7.17 Adjustable Speed Drive Systems 1 12 24 7.18 Direct-Current Systems 1 12 12 7.18.1 Batteries 1 12 12 12 7.18.2 Battery Chargers 1 12 12 12 7.18.3 Rectifiers 1 12 24 7.19 Surge Arresters 2 12 24		Motor Control				
7.16.2.1 Low-Voltage Motor Control Centers 2 12 24 7.16.2.2 Medium-Voltage Motor Control Centers 2 12 24 7.17 Adjustable Speed Drive Systems 1 12 24 7.18 Direct-Current Systems 1 12 12 7.18.1 Batteries 1 12 12 7.18.2 Battery Chargers 1 12 12 7.18.3 Rectifiers 1 12 24 7.19 Surge Arresters 7.19.1 Low-Voltage Devices 2 12 24	7.16.1.1	Low-Voltage Motor Starters		12	24	
7.16.2.2 Medium-Voltage Motor Control Centers 2 12 24 7.17 Adjustable Speed Drive Systems 1 12 24 7.18 Direct-Current Systems 1 12 12 7.18.1 Batteries 1 12 12 7.18.2 Battery Chargers 1 12 12 7.18.3 Rectifiers 1 12 24 7.19 Surge Arresters 7.19.1 Low-Voltage Devices 2 12 24	7.16.1.2	Medium-Voltage Motor Starters	2	12	24	
7.17 Adjustable Speed Drive Systems 1 12 24 7.18 Direct-Current Systems 1 12 12 7.18.1 Batteries 1 12 12 7.18.2 Battery Chargers 1 12 12 7.18.3 Rectifiers 1 12 24 7.19 Surge Arresters 7.19.1 Low-Voltage Devices 2 12 24	7.16.2.1	Low-Voltage Motor Control Centers	2	12	24	
7.18 Direct-Current Systems 7.18.1 Batteries 1 12 12 7.18.2 Battery Chargers 1 12 12 7.18.3 Rectifiers 1 12 24 7.19 Surge Arresters 7.19.1 Low-Voltage Devices 2 12 24	7.16.2.2	Medium-Voltage Motor Control Centers	2	12	24	
7.18.1 Batteries 1 12 12 7.18.2 Battery Chargers 1 12 12 7.18.3 Rectifiers 1 12 24 7.19 Surge Arresters 7.19.1 Low-Voltage Devices 2 12 24	7.17	Adjustable Speed Drive Systems	1	12	24	
7.18.2 Battery Chargers 1 12 12 7.18.3 Rectifiers 1 12 24 7.19 Surge Arresters 7.19.1 Low-Voltage Devices 2 12 24	7.18	Direct-Current Systems				
7.18.3 Rectifiers 1 12 24 7.19 Surge Arresters 7.19.1 Low-Voltage Devices 2 12 24	7.18.1	Batteries	1	12	12	
7.19 Surge Arresters 7.19.1 Low-Voltage Devices 2 12 24			1	12	12	
7.19.1 Low-Voltage Devices 2 12 24		Rectifiers	1	12	24	
		Surge Arresters				
7.19.2 Medium- and High-Voltage Devices 2 12 24						
	7.19.2	Medium- and High-Voltage Devices	2	12	24	

APPENDIX B (cont.) Inspections and Tests (Frequency in Months) Multiplier for Inspections and Tests (Multiply Value by Matrix)

			Visual &	Visual & Mechanical	
Section	Description	Visual	Mechanical	& Electrical	
7.20	Capacitors and Reactors				
7.20.1	Capacitors	1	12	12	
7.20.2	Capacitor Control Devices	1	12	12	
7.20.3.1	Reactors – Dry-Type	2	12	24	
7.20.3.2	Reactors – Liquid-Filled	1	12	24	
	Sampling	_	_	12	
7.21	Outdoor Bus Structures	1	12	36	
7.22	Emergency Systems				
7.22.1	Engine Generator	1	2	12	
	Functional Testing	_	_	2	
7.22.2	Uninterruptible Power Systems	1	12	12	
	Functional Testing	_	_	2	
7.22.3	Automatic Transformer Switches	1	12	12	
	Functional Testing	_	_	2	
7.23	Telemetry/Pilot Wire SCADA	1	12	12	
7.24	Automatic Circuit Reclosers and Line Sectionalizers				
7.24.1	Automatic Circuit Reclosers, Oil/Vacuum	1	12	24	
	Sample	_	_	12	
7.24.2	Automatic Line Sectionalizers, Oil	1	12	24	
	Sample	_	_	12	
7.27	EMF Testing	12	12	12	